Claim(s)

We claim:

1. A method for storing data conveyed by each of a plurality of packets arriving at a network switch port in a memory of the network switch port, and for thereafter reading the data out of the memory and forwarding the data from the switch port, wherein each packet also conveys a flow identification number (FIN) identifying a source of the packet, the method comprising the steps of:

a. generating a separate cell sequence corresponding to each packet arriving at the network switch, wherein each cell of each cell sequence contains a separate portion of the data conveyed by cell sequence's corresponding packet;

b. writing cells of each cell sequence generated at step a into separate storage blocks of the memory such that the memory stores cells of a plurality of cell sequences corresponding to the plurality of packets;

c. assigning a forwarding mode to each cell sequence of the plurality of cell sequences in response to the FIN included in each cell sequence's corresponding packet, such that a sequence-by-sequence forwarding mode is assigned to some of the cell sequences, and such that a cell-by-cell forwarding mode is assigned to others of the cell sequences;

d. reading cells of each cell sequence out of the memory and forwarding them from the network switch port,

wherein all cells of each cell sequence assigned the sequence-by-sequence forwarding mode are sequentially read out of the memory in uninterrupted succession during an interval when no cell of any other cell sequence is being read out of the memory; and

wherein cells of separate cell sequences assigned the cell-by-cell forwarding mode are alternately read out of the memory such that cell sequences assigned the cell-by-cell mode are interleaved when read out of the memory.

2. The method in accordance with claim 1 further comprising the steps of:

e. assigning cells of each cell sequence generated at step a to one of a plurality of flow queues selected in response to the FIN included in the cell sequence's corresponding packet; and

f. separately determining for each flow queue, an average rate at which cells of cell sequences assigned to that flow queue are to be read out of the cell memory, wherein cells assigned to each flow queue are read out of the cell memory at step d at the determined average rate for that flow queue.

3. The method in accordance with claim 2 further comprising the step of:

g. maintaining a separate flow queue list corresponding to each flow queue,

wherein the flow queue list includes a separate entry corresponding to each cell stored in the cell memory,

wherein each cell's entry references that cell's storage location in the cell memory,

wherein each flow queue list indicates an order in which cells assigned to its corresponding flow queue were written into the memory at step b, and

wherein the flow queue list corresponding to each flow queue controls an order in which cells assigned to that flow queue are read out of the cell memory at step d.

4. The method in accordance with claim 3

wherein each entry of each flow queue list maintained at step g also includes an EOP bit,

wherein the EOP bit is set to a true state when the cell corresponding to the flow queue entry is a last cell of any cell sequence generated at step a,

wherein the EOP bit is set to the true state when the cell corresponding to the flow queue entry is any cell of any cell sequence assigned the cell-by-cell forwarding mode at step c, and

wherein the EOP is set to a false state when the cell corresponding to the flow queue entry is other than a last

cell of any cell sequence assigned the sequence-by-sequence forwarding mode at step c.

5. The method in accordance with claim 4 wherein a state of the EOP bit included in each entry of the flow queue list corresponding to each cell sequence controls the forwarding mode of the cell sequence when the cell sequence is read out of the cell memory at step d.

6. An apparatus for storing data conveyed by each of a plurality of packets and for thereafter forwarding data conveyed by the packets, wherein each packet also conveys a flow identification number (FIN), the method comprising the steps of:

a cell memory having a plurality of storage blocks;

protocol processor means for generating a separate cell sequence corresponding to each packet, wherein each cell of each cell sequence contains a separate portion of the data conveyed by cell sequence's corresponding packet;

data path controller means for writing cells of each cell sequence generated by the protocol processor into separate storage blocks of the cell memory such that the cell memory stores cells of a plurality of cell sequences corresponding to the plurality of packets and for thereafter reading cells of each cell sequence out of the cell memory when signaled to do so, and for thereafter forwarding read out cells from the network switch port; and

queuing system means for assigning a forwarding mode to each cell sequence of the plurality of cell sequences in response to the FIN included in each cell sequence's corresponding packet, such that a sequence-by-sequence forwarding mode is assigned to some of the cell sequences, and such that a cell-by-cell forwarding mode is assigned to others of the cell sequences, and for signaling the data path controller means when it is to read each cell out of the cell memory,

such that all cells of each cell sequence assigned the sequence-by-sequence forwarding mode are sequentially read

out of the cell memory in uninterrupted succession during an interval when no cell of any other cell sequence is being read out of the cell memory; and

such that cells of separate cell sequences assigned the cell-by-cell forwarding mode are alternately read out of the cell memory such that cell sequences assigned the cell-by-cell mode are interleaved when read out of the cell memory.

7. The apparatus in accordance with claim 6

wherein the queuing means assigns cells of each cell sequence generated at step a to one of a plurality of flow queues selected in response to the FIN included in the cell sequence's corresponding packet,

wherein the queuing means separately determines for each flow queue, an average rate at which cells of cell sequences assigned to that flow queue are to be read out of the cell memory, and

wherein the queuing means signals the data path controller means to read cells assigned to each flow queue out of the cell memory at the determined average rate for that flow queue.

8. The apparatus in accordance with claim 7

wherein the queuing means maintains a separate flow queue list corresponding to each flow queue,

wherein the flow queue list includes a separate entry corresponding to each cell stored in the cell memory,

wherein each cell's entry references that cell's storage location in the cell memory,

wherein each flow queue list indicates an order of arrival in the cell memory of cells assigned to its corresponding flow queue, and

wherein the queuing means consults the flow queue list corresponding to each flow queue to determine an order in which the data path controller means is to read cells assigned to that flow queue out of the cell memory.

9. The apparatus in accordance with claim 8

wherein each entry of each flow queue list maintained at also includes an EOP bit,

wherein the queuing means sets the EOP bit to a true state when the cell corresponding to the flow queue entry is a last cell of any cell sequence,

wherein the queuing means sets the EOP bit to the true state when the cell corresponding to the flow queue entry is any cell of any cell sequence assigned to the cell-by-cell forwarding mode at step c, and

wherein the queuing means sets the EOP to a false state when the cell corresponding to the flow queue entry is other than a last cell of any cell sequence and is a cell of any sequence assigned to the sequence-by-sequence.

10. The apparatus in accordance with claim 9 wherein the queuing means consults the state of EOP bits included the flow queue list for each flow queue prior to signaling the data path controller means to read out cells of any cell sequence assigned to that flow queue to determine the forwarding mode of the cell sequence.

11. The apparatus in accordance with claim 10 wherein each cell of each cell sequence generated by the protocol processor also includes the FIN conveyed by the cell sequence's corresponding packet.

12. The apparatus in accordance with claim 11

wherein the data path controller means transmits a copy of the FIN included in each cell to the queuing means when the data path controller means writes the cell into a storage block of the memory, and

wherein the queuing means sets the state of the EOP bit included in the flow queue list corresponding to that cell in response to the transmitted copy of the FIN.